

PV System Review and Evaluation:

A Consumer Awareness View of Available Systems

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Commonwealth Biogas/PV Mini-Grid Renewable Resources RD&D Program

- Resource Assessment (Project 1.1)
- Landfill Bioreactor (Project 2.1)
- Sewage Wastewater Digestion (Project 2.2)
- Animal Manure Digestion (Project 3.1)
- **Building Integrated PV (Project 3.2 and 3.3).**

Project 3.2 Building Integrated PV Testing and Evaluation Project Goals

- Address the gap between future third-party certified PV component and system performance results and currently available information from manufacturers
- Provide an independent comparative evaluation of PV systems critical to Project 3.3 and to the Commission Buydown Program
- Provide decision-making information on those PV systems: ***detailed system performance data and “Consumer Reports” style evaluation.***
- Improve the quality of systems installed in Project 3.3 through directed training

Project 3.2 Objectives

- Select, procure, install, and evaluate three **Commercial Scale** candidate PV Systems for implementing Project 3.3 BIPV on Public Buildings
- Evaluate selection, ease of installation, performance, other issues that may impact life-cycle costs
- Determine flaws, weak points, poor design features, etc. and offer suggested fixes
- Monitor and report on system performance for 12 months
- Develop recommendations for system purchases.
- **Duplicate the process for three Residential Scale systems**

Project 3.2 Building Integrated PV Testing and Evaluation Project

- Large System Evaluation
 - Three 20-kW Commercial-type PV Systems
- Small System Evaluation
 - Three 3-kW Residential PV Systems
- Tech Transfer
 - Web Page
 - Technical Papers/Presentations
 - Workshops

System #1: 20kW Sloped PowerGuard by PowerLight Corporation

- Newly released PIER-funded product
- Using the latest 190-Watt Sanyo Hybrid a-Si/c-Si Technology
- Non-penetrating
- Lightweight (4 lb/ft²)
- 10° tilt
- Xantrex Inverter



Large System Test Site: Inland Empire Utilities Agency Headquarters Building



PowerLight Sloped PowerGuard Installation





PowerLight 20 kW Sloped PowerGuard



System #2: 20kW SunRoof FS by Schott Applied Power Corporation

- Newly released, PIER-funded FS (Free Standing) product
- ASE Edge-defined Film-fed Growth Technology
- Non-penetrating Mount
- Lightweight (3-6 lb/ft²)
- 5° tilt
- Xantrex Inverter



RWE Schott Solar Sunroof FS Install



RWE Schott Solar Sunroof FS Install



RWE Schott 20 kW FS System



System #3: 20kW Multi-String System

- Mounted on freestanding mounting system
- 10 individual 2 kW_{ac} PV strings
- Details of systems selected by TAC
 - 9 PV technologies represented
 - 9 manufacturers
 - 2 Uni-Solar Arrays: (1) Framed modules on racks; and, (2) flexible laminates adhered directly to roof.
 - Thin films: triple junction a-Si, CIS, and CdTe
 - Crystalline: mc-Si, pc-Si, pc-Si film, and SR-c-Si (String-Ribbon Crystal film), Edge-defined Film-fed Growth, mc-Si with a-Si top layer
- Uses SMA Sunnyboy for consistency, data logging

First Solar Easy Mount



First Solar Easy Mount



Solar Integrated Technologies with UniSolar Laminates



Solar Integrated Technologies with UniSolar Laminates



Independent Energy Solutions Solar Quilt Mounting System



IES Solar Quilt with AstroPower APx-130



IES Solar Quilt with UniSolar US-116

Six 2kW Arrays with Identical Mounts and Inverters





Six 2kW Arrays with Identical Mounts and Inverters

- AstroPower AP-110
- BP Solar SX-140
- Evergreen EC-102
- SAPC-123 (Sharp)
- Shell Solar SP-140
- Shell Solar ST-40 (CIS)

Electrical Balance of System Installation











































































Sandia Test Support



Detailed Inverter Performance Evaluation

- Inverter + Modules = System Performance
- Need 3rd party standardized evaluation
- PowerMark, ASU/PTL, FSEC, ESTI commercially instituting module performance evaluation
- Sandia developing inverter performance evaluation, but no commercial testing yet

Large System Evaluation Summary

System	Documentation	Shipping	Mounting	Installation	Performance	Cost
PowerLight						
RWE FS						
SIT						
First Solar						
IES US-116						
IES APx-130						
AP-110						
BP SX-140						
EC-102						
SAPC-123						
Shell SP-140						
Shell ST-40						

Small System Evaluation



Coming soon...

Small System Eval: Potential Systems

- AstroPower
 - SunUPS
- Kyocera
 - MyGen
- Schott APC
 - SunRoof RS
- Sharp Solar

Is this needed or wanted?

- Consumers want more information from sources they feel they can trust.
- Consumers don't know the information they want.
- Focusing attention on key system parameters helps the consumer better understand what to look for and help manufacturers identify areas they want to improve.

What defines success?

- Success of the project will be based on several factors
 - Quality of the information
 - Use of information by consumers and installers
 - Support from PV industry: “We need this”
 - Participation of CEC and other project members.
 - Improvements and product changes in response to project evaluations

Where to find information about the project...

- www.pierminigrid.org
- www.endecon.com
- Stay Tuned...

